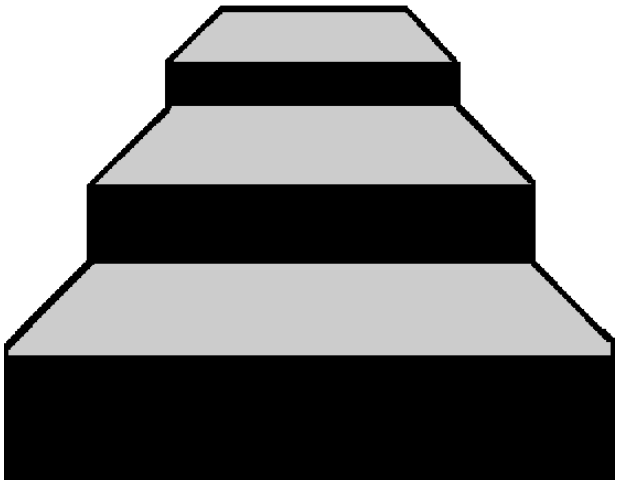
Introduction to STEP



STEP Tools, Inc.
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- **STEP is an International Standard (ISO 10303)**
  - **that defines the methodology to create computer interpretable product data models.**
- **STEP Implementation**
  - **allows exchange and sharing of product data while retaining semantics throughout the product life cycle.**

- **EXPRESS is an information modeling language**
  - **Transparent to user**
  - **Used to create and define data models in STEP**
  - **Well defined structure**
- **Intelligent Data**
  - **Engineering drawing title block contains inserted text strings; EXPRESS has intelligence in product data models to interpret this data**

- **Structure of Data**
  - **Within a Part**
    - » **geometry, topology, tolerances, etc.**
  - **About the Part**
    - » **part name, number, security classification, revision, approval**
  - **About a Product (Group of Parts)**
    - » **assemblies, relationships, configurations, effectivities**
- **Meaning of Data (Semantics/Context)**

- STEP is intended to define the standardized descriptions of product data that are suitable for neutral file exchange
- STEP also provides a basis for implementing and sharing product databases

- Initiated by data originator
- Transformed into a neutral format
- Content determined by discrete event in time
- Redundant copy of data created

- Initiated by data receiver
- Data on demand
- Data access levels embedded in protocol
- Appears as single data source
- Read (real-time) and update capabilities

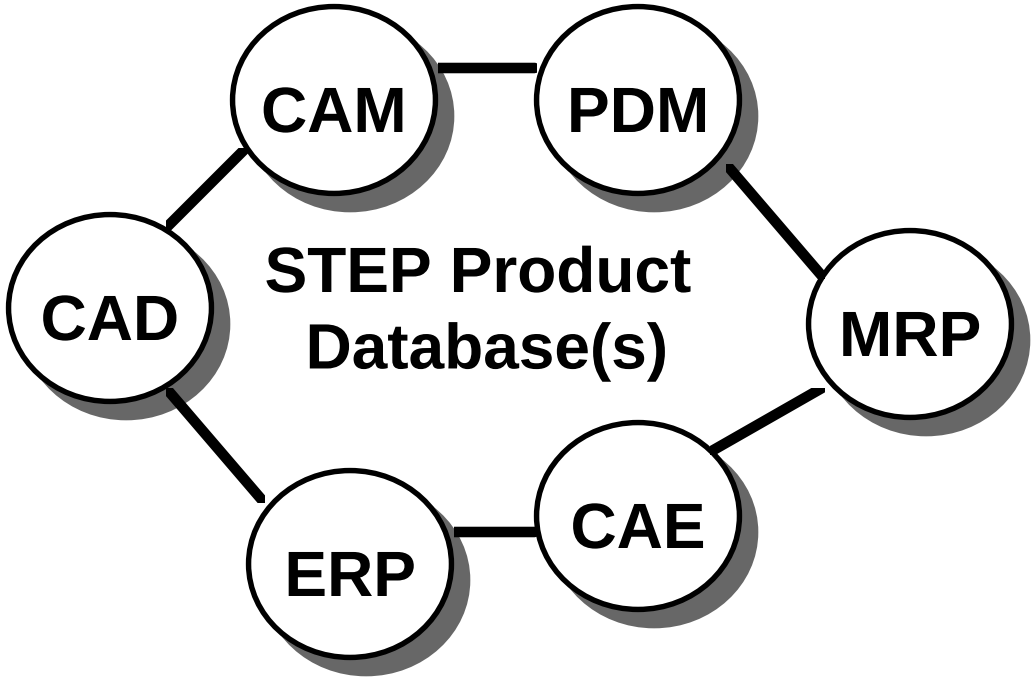
- **Same CAD System, Line Drawn in a File**
  - **3D Piping Company, Line may be a pipe**
  - **Electrical Company, Line may be a wire**
- **Definition of “Secure” the Building**
  - **Navy, turn lights out and lock doors**
  - **Army, create defensive perimeter/defend it**
  - **Air Force, lease building with option to buy**
  - **Marines, reduce to ruble and concur**

- **An Application Protocol defines the usage (semantics) of STEP product data for a given application context.**
- **An Application Protocol represents a measurable and shareable subset of STEP capability that is expressed in an industry's or discipline's terminology.**

- **Configuration Controlled 3D Designs of Mechanical Parts and Assemblies**
- **Within a Part**
  - **Geometric Shape: advanced BREP solids, faceted BREP solids, manifold surfaces with topology, wireframe with topology, surfaces and wireframe without topology**
- **About the Part**
  - **Specifications: surface finish, material, design, process, filename**
  - **Configuration management: authorization, control, effectivity, release status, security classification, supplier**
- **About a Product (Group of Parts)**
  - **Product Structure: assemblies, bill of materials, part, substitute part, alternate part**

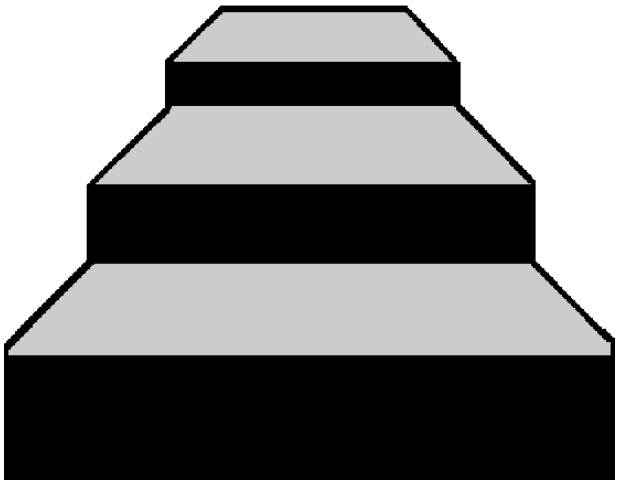
- **Associative Draughting**
- **Within a Part**
  - **Geometric Shape: advanced BREP solids, faceted BREP solids, elementary BREP solids, manifold surfaces with topology, wireframe with topology, surfaces and wireframe without topology, geometrically bounded 2D shape**
- **About the Part**
  - **Annotation: text, annotation curves, symbols, subfigures, fill areas, dimensions**
  - **Drawing structure: drawing revision, sheet revisions, views, drafting specifications, contract, security classification, approvals, responsible organizations**
- **About a Product (Group of Parts)**
  - **Product relation: part, responsible organization**
  - **Grouping: layers, groups**
  - **Associativity: from geometric model to dimensions, callouts, and fill areas**

- Data sharing through different life cycle applications
- STEP allows access to all types of data across the life cycle



- **STEP is an International Standard (ISO 10303)**
  - **that defines the methodology to create *computer interpretable* product data models.**
- **STEP Implementation**
  - **allows *exchange and sharing of product data* while retaining the semantics *throughout the product life cycle*.**

STEP Implementation Methods



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- **STEP data sets are described by an EXPRESS schema, so:**
  - **Data transport mechanisms should be based upon the EXPRESS.**
  - **Application program access should be based upon the EXPRESS.**
- **This is the purpose of the STEP implementation methods. These are the 20-series of STEP documents.**

Infrastructure

Description Methods
#11 EXPRESS
#12 EXPRESS-I

Implementation Methods
#21 Physical File
#22 SDAI Operations
#23 SDAI C++
...

Conformance Testing
#31 General Concepts
#32 Test Lab Reqs.
#33 Abstract Test Suites
...

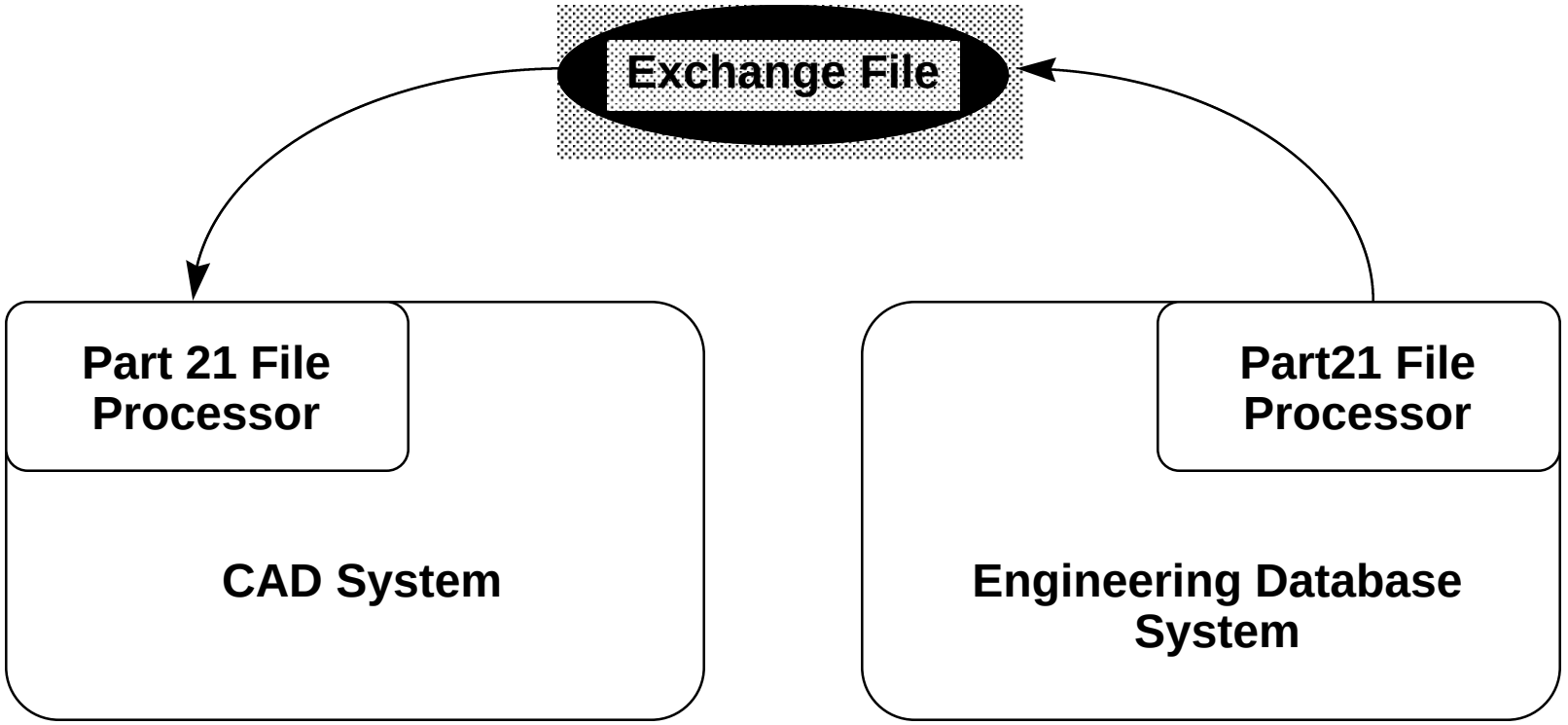
Information Models

Application Protocols
#201 Explicit Drafting
#202 Assoc. Drafting
#203 Config Ctl. Design
...

Application Integrated Resource
#101 Drafting
#102 Ship Structures
...

Generic Resources
#41 Product Descr
#42 Geom & Topology
#43 Representation
....

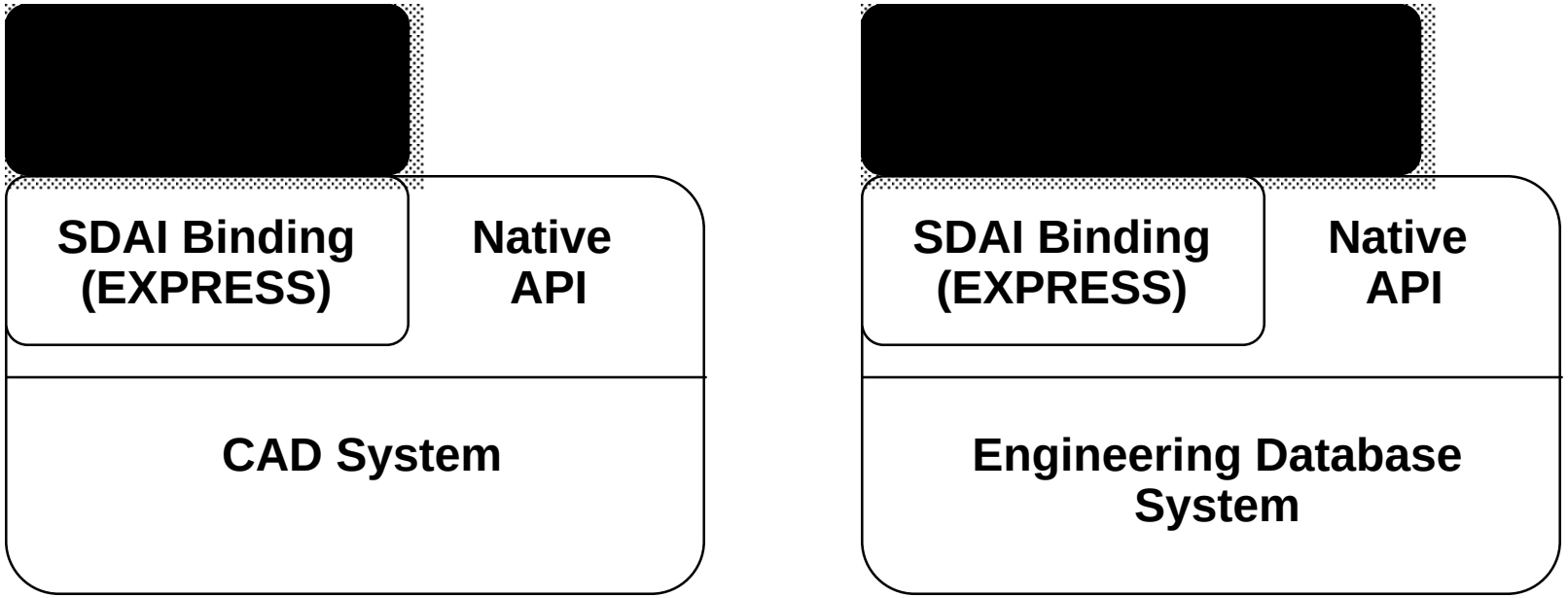
- **The STEP Part 21 exchange file format is a standard file format for communicating data sets defined by an EXPRESS schema.**



- **The SDAI is a standard application programming interface (API) for manipulating data sets defined by an EXPRESS schema.**
  - **Allows application software to be written independently of data storage systems.**

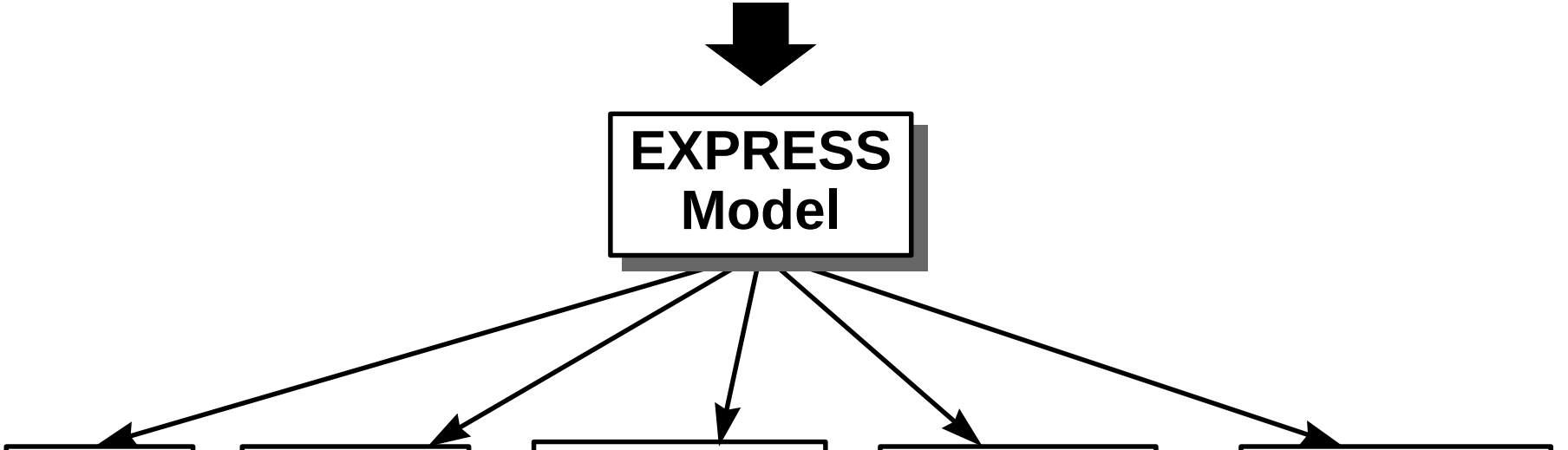
- **Engineering code is expensive to develop and tightly tied to an information model. The SDAI reduces the cost by allowing more reuse.**

- **Programming interface for manipulating data sets as if they were defined by an EXPRESS schema.**
- **Layered on top of any system that wishes to present data according to EXPRESS model.**

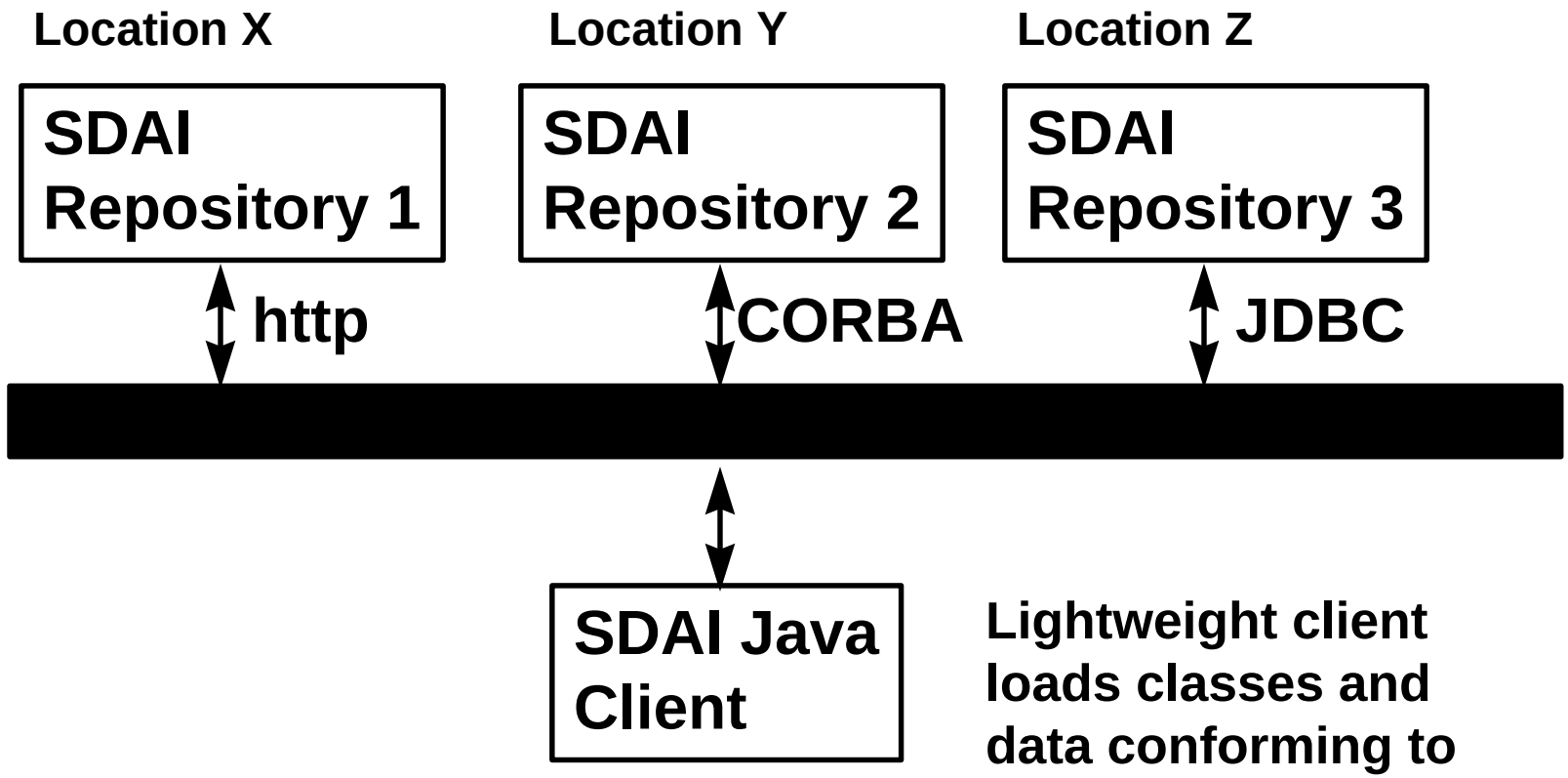


- Programming interface for manipulating data sets defined by an EXPRESS schema.
- Five Specifications — Functional descriptions of operations, bindings to C++, C, IDL and Java.
- Operations allows application software to be written against EXPRESS model independent of data storage systems.
- Logical organization of data independent of data storage systems.
- Some bindings provide an EXPRESS data dictionary.

Defined by STEP or other Industry Group



ASCII File	SDAI C API	SDAI C++ API	SDAI IDL API's	SDAI Java API
Part 21 Standard	Part 24 Draft Standard Late binding	Part 23 Committee Draft Early and late binding	Part 26 Working Draft Early binding	Part ?? New Work Item Early binding Light weight



- **Separating the functional requirements from individual language bindings allows us to adapt as technology changes.**
  - **Fortran binding cancelled**
  - **CORBA/IDL binding recently added.**
  - **Java binding planned**

This has already happened, will happen again. The next binding could be ...